

SOFTWARE PLATFORM FOR GAMIFICATION IN THE UNIFIED STATE EXAMINATION PREPARATION ACTIVITIES

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ABSTRACT

In the paper we present a software platform for applying gamification to the Unified State Examination (USE) preparation activities in the Russian Federation.

The USE is a final examination at school as well as a university entrance examination. Students' preparing for the examination takes a long time and is accompanied by solving a large number of similar tasks. Over time students' interest in these activities is reducing, which leads to unsatisfactory results.

We developed a mobile learning tool for the USE preparation which uses game mechanics to increase the involvement of students in the process of preparing for the USE. These mechanics are based on our model of implementing the gamification in the educational process and include the particular properties of the Unified State Examination. We've implemented the model in a platform consisting of mobile applications (iOS, Android) for students and a web-application for a teacher. The platform provides a support for the USE preparation activities at school and outside it. It lets students execute different types of the USE tasks as a training and simulate the examination with a complete set of tasks and a time limit. The processes are accompanied by visualization of user's progress, competition in a form of other students' success rating, receiving badges for special sets of actions, etc. Detail description of the game mechanics and capabilities of the platform are presented in the paper. This is a follow up paper to the preliminary report (Khasianov and Shakhova, 2017).

KEYWORDS

Mobile Learning, Education, Software Engineering, Unified State Examination

1. INTRODUCTION

Gamification application in preparing for the Unified State Examination is considered in this research. Universal State Examination (USE) preparation takes about two years and includes a lot of routine and stressful for students activities. The preparation at large consists of solving a large number of similar tasks that leads to decrease of students' motivation. The students don't have any relevant feedback neither about their progress nor on growth of their competences of solving of the USE tasks. Students have opportunities to pass training examination a few times, but it isn't enough. The training becomes a stressful event and often doesn't allow to adequately measure competences because of it, but organization of extra trainings requires a significant share of teacher's time for assessment of the students' submissions.

The general idea of this research is to transfer routine work to a digital tool implemented as a software platform which was developed with some game mechanics as was stated in the earlier work where the general model was described (Khasianov and Shakhova, 2017).

Aparicio et al. 2012 describe a general method how gamification can be involved as a tool to improve participation and motivation. Essentially we follow the same steps: *Identification of the main objective* (USE preparation); *Identification of the transversal objective* (to perform better in solving tasks, to get a higher USE grade); *Selection of game mechanics support* (described separately), *Effectiveness analysis* (comparison of performance of the experimental and control groups). A very recent and a thorough review of advantages and disadvantages of using gamification in education is done by Sobocinski, 2018, where the author also mentions that education is already naturally gamified. It is indeed so, but it is important to underline

importance of mobile learning in the context of gamification for education. Namely, there are certain properties of mobile platform that make it a must for education gamification best practices: *continuous data collection*; *constant timely feedback*; *IoT infrastructure integration*. There's also a recent review on most preferred mobile apps for gamification in the higher education context done by Bicen and Kocakoyun, 2017. It generally supports the fact that majority of students access digital tools on their mobile devices, and that proper utilisation of these tools improve participation and motivation, although this was not stated by the authors explicitly. There's no so far a study if the effect of using mobile learning in USE preparation.

The solution provides the opportunities to: a) transfer the USE activities from the classroom activities to the mobile application; b) track students' progress and get some awards which allows to support student's interest; c) model training examination with over 400 different random the USE questions any time; d) automate assessment of the major part of the assignments submitted by students.

Despite of the transfer of the USE preparation activities to the online platform we should keep the opportunity for the students to receive adequate and timely feedback by the teacher. That is our solution has to support at list minimal communication. We should also note that teachers' a feedback and asynchronous nature of training is necessary for the platform to work for most of the students.

The paper includes the information about game mechanics which are used in the software platform and the description of the system capabilities.

2. GAME MECHANICS

The game mechanics of the platform are based on approaches of implementing the gamification in the educational process described in *Gamification in higher education: Kazan Federal University primer* (Khasianov et al., 2016) and model presented in *New model of mobile learning for the high school students preparing for the Unified State Exam* (Khasianov and Shakhova, 2017). In the software platform we use the same mechanics that were confirmed to be effective for the educational process: *goals, challenges, feedback and social interaction*.

According to *Practical proposals for motivating students* (Forsyth and McMillan, 1991) it is important to identify valuable goals as it increases motivation. The goal should be positive, realistic, behaviorally specific and personally important (Danish et al., 1983). In our case the student's goal is achievement of the maximum score on the examination. The score consists of points for the solved tasks in each examination discipline. The student must pass only two exams - the Russian language and mathematics. Other subjects can be selected by the student if it's necessary to provide these results for admission to the university. Obviously, the maximum score is an individual index depending on a student's personal wishes and abilities. For maintaining an individual approach to achieving the goal our system lets students solve tasks of different levels in any order.

The Unified State Examination consists of two types of tasks: tasks with a short answer and tasks with a detailed answer. The tasks are challenges that are necessary for tracking student's progress in the process of achieving the goal (Brothy, 2010). The scores that are obtained as a result of these tasks form a final score of the discipline. The tasks with a short answer support automatic checking and scoring. The tasks with a detailed answer that require a teacher's mark are sent for peer review.

Preparing for the Unified State Examination takes a long time and the absence of a continuous feedback may have a negative effect on students' motivation. It means that students can be uncertain about their position in achieving goals or need help. It is crucial to get the fast feedback throughout the whole process (James, 1998). It allows participants to control the process of proceeding towards their goals and correct their behaviour depending on the current progress indices. Although most of the tasks are checked by the system automatically what provides instant updates of the user's progress, a teacher is an important object of the model.

The opportunity to compete with other students or groups of students has a positive effect on extrinsic motivation and stimulates learning activity (Deci et al., 1991). The individual student's rating is the main component of the Unified State Examination and it forms the status of a student depending on his progress.

3. THE PLATFORM

Described game mechanics were implemented in the software platform consisting of mobile applications (iOS, Android) for students and a web-application for a teacher.

The goal is to obtain a maximum number of points for each topic of a discipline. The goal is measured in the number of earned points. The topic can consist of two types of tasks: tasks with a short answer and tasks with a detailed answer.

The challenge (or task) is measured in points that can be obtained by solving the task. Simple tasks with a solution in a fixed form the points are given if the answer is correct. This type of tasks is checked by the system automatically, students can see their performance virtually in real-time manner. Tasks with an elaborate answer required score the maximum points that can be reached. A solution to this type of a task can be submitted in a form of a digital scan or photo of the solution. The solutions are sent to a teacher and become available in the teacher's user account. The school and the teacher should be selected by the student via the student's interface of the platform. The teacher assigns a score in the system after checking the task and the score is displayed in the student's mobile application.

The software platform also includes one more game feature called a *badge*. A *badge* is an award which can be received through a student's activities in the mobile application. The *goal achievement* is completed with a *badge*, in addition, *badges* can be obtained by performing certain challenges or combinations of certain actions with the mobile application. This opportunity was added for a surprise effect that supports the students intrinsic motivation (Deci E.L., 1971), and helps avoid decrease of it. All of the obtained *badges* are available in the user's profile of the mobile application.

The total number of points creates an individual rating of the student. This allows addition of competitive effect and visualize the student's progress.

The mobile application features ability to:

- choose topics for training, solve the tasks of the topics in any desired order, get a fast feedback about correctness of the answers and accumulate points;
- pass training examination with a complete set of tasks and a time limit;
- track progress of a specific student, get the students' rating compared against other students' performance;
- receive and collect badges;
- get information about other students and their successes.

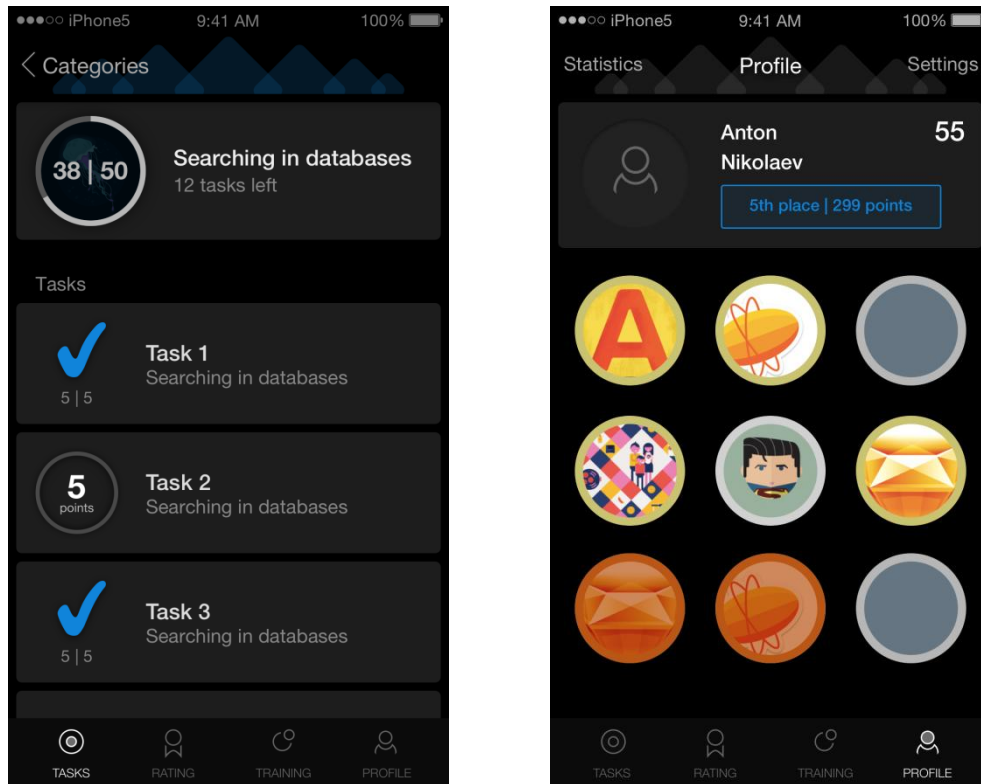


Figure 1. The User Interface of Mobile Application for Students

In order to illustrate the interface two screens of the application are presented on Figure 1: The screen with a list of tasks (solved tasks are checked) and the screen of a user's profile. The first screen has information about possible/achieved points of the topic, tasks remaining to solve, solved tasks, points for the specific tasks. The second screen provides the data of a user's profile: name, number of points in the system and position in the rating, received badges and the Unified State Examination point of the last training attempt.

The web-application lets teachers:

- view their students' solved tasks, check the answers and assign a score for the tasks with a detailed answer;
- get information about their students' successes and the common rating of the students.

4. CONCLUSIONS

The application has been developed with .Net technology on the server side and the teacher's web-interface and Objective C for iOS mobile application, and Java for Android mobile application.

The first version of the described platform will be introduced as an experiment in the Unified State Examination preparation activities of one of Russians schools. The students of the 10th grade get an opportunity to prepare for the USE of Informatics. We carried out a poll shown that one hundred percent of students (22 persons) are owners of mobile devices with one of two operating systems (iOS, Android). The statistics of mobile operation systems showed that 15 mobile devices running Android 5.0 and higher, 3 devices - Android 4.4, 3 devices - iOS 10 and higher, 1 device running Android 4.2.

Full audience coverage enables to track all students' indices and get correct results in analysis. The students' indices of the Unified State Examination in training attempts will be collected during this stage of the experiment and analysed after its completion.

After the experiment we'll get information about new game mechanics which could be added to the software platform and the next direction of the research.

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